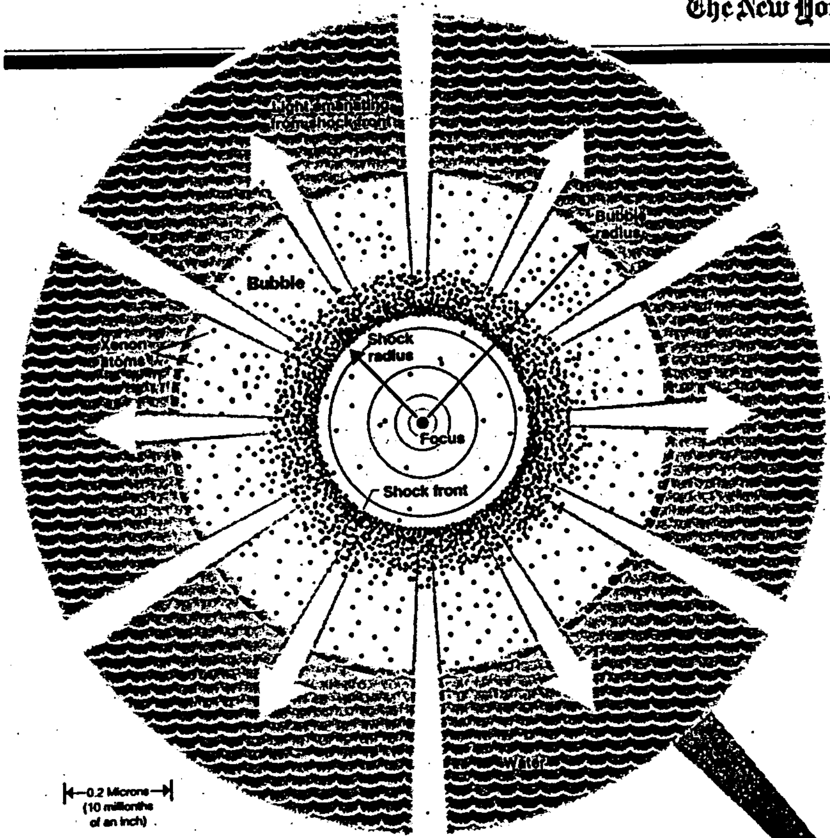
12/20/94

Science Times

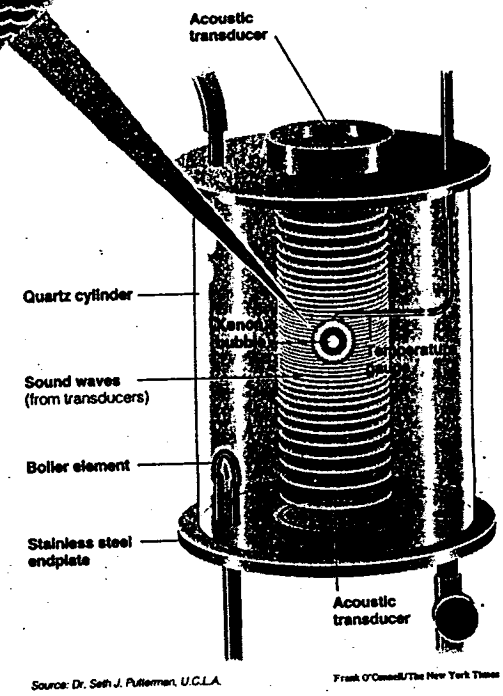
The New York Times

New Shot at Cold Fusion By Pumping Sound Waves Into Tiny Bubbles



New Fusion Recipe: Sound Plus Bubbles

Fusion creates great energy but requires tremendous temperatures. In a new approach that scientists hope might reach such temperatures, they are using minuscule bubbles as the focus for sound waves. In this figure, a tiny heating element boils just enough water to create a single micron-sized bubble. A sound field makes the bubble pulsate. As it expands, it absorbs sound energy. Then it violently collapses, launching a spherical, inward-moving supersonic shock wave, which produces enormous temperatures and a flash of light.



Source: Dr. Seth J. Putterman, U.C.L.A.

Frank O'Connell/The New York Times

By MALCOLM W. BROWNE

Ever since the first hydrogen bomb was detonated in 1952, scientists have sought to harness thermonuclear fusion as a peaceful power source, but that goal has proved tantalizingly elusive. Now, however, there seems to be an outside chance that a wholly new technique could achieve it. Bombarding microscopic bubbles with intense sound waves could convert the bubbles into minuscule fusion furnaces.

Recent experiments by a half-dozen laboratories suggest that a mysterious phenomenon called sonoluminescence may be capable of raising the temperature of gas trapped in a tiny bubble to 1.8 million degrees Fahrenheit or more — enough, in principle, to ignite fusion.

If fusion were achieved, a microbubble could be expected to radiate neutrons, nuclear particles produced by thermonuclear reactions. So far, the laboratories experimenting with sonoluminescence have failed to detected any neutrons, but there are other signs that the project is far from hopeless.

In the 1930's German physicists discovered that when intense sound waves vibrating at a fixed frequency are blasted into a liquid filled with tiny bubbles, the bubbles oscillate, collapse and emit flashes of light. In the decades since the discovery of sonoluminescence, physicists have occasionally experimented with the phenomenon, but only in recent years have many of the most startling characteristics of sonoluminescence come to light.

> Stressed bubbles implode in a flash of light and startlingly high temperatures.

In 1987, a research group led by Dr. Kenneth S. Suslick, a chemist at the University of Illinois in Champaign-Urbana, created clouds of sonoluminescent bubbles in a bath of liquid dodecane, a hydrocarbon solvent similar to gasoline. By measuring the colors of the spectrum of light emitted by the bubbles, Dr. Suslick calculated that the gas in the bubbles had to be at a temperature of about 9,000 degrees Fahrenheit, a startlingly high temperature, considering that the surrounding liquid did not appear to be heated at all.

Dr. Suslick's group created clouds of light-emitting bubbles by a process called cavitation, simply by exposing fluids to intense sound "fields" — a permeating environment of sound created by transducers (little loudspeakers) surrounding the fluid. In a typical reaction flask, Dr. Suslick found, bubbles formed and collapsed at a rate of several million a second.

At the University of California in Los Angeles, a team of physicists headed by Dr. Seth J. Putterman

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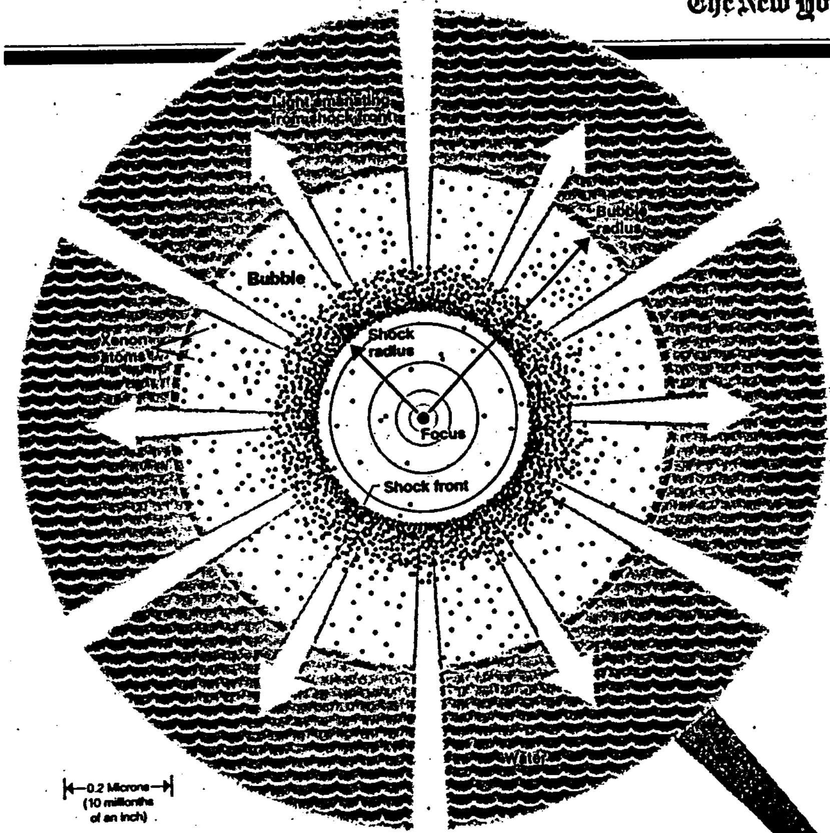

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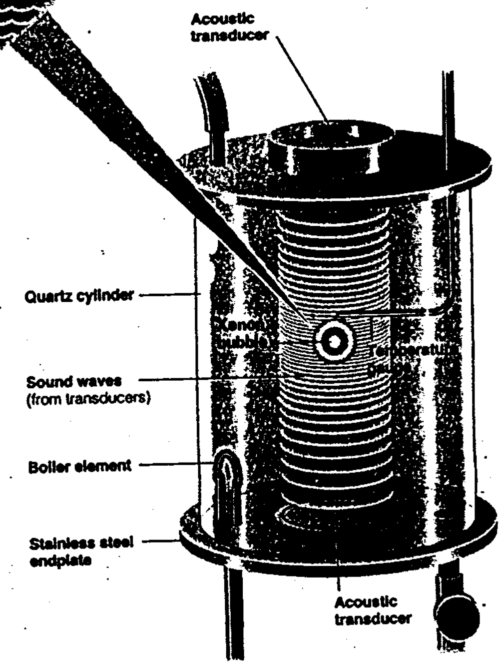

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